Impact of Reliability Centered Maintenance Program

Long Island Rail Road & Metro-North Railroad

Maintenance of Equipment
Objective

• Describe the success of the MNR/LIRR Reliability Centered Maintenance (RCM) goals for protecting the M7 fleet’s reliability and availability

• Describe Critical Components of the RCM process

• Describe Common Goals & Opportunities

• Demonstrate RCM effectiveness

• Discuss Future Challenges
Reliability Centered Maintenance (RCM)

What is it?

A maintenance strategy to maximize vehicle availability while simultaneously minimizing material and labor costs as well as unscheduled repairs.

- Maintain Vehicle through-out design life
  - Protect Capital Investment over 35 Years

- Maximize fleet reliability and availability
  - Improve OTP and Consist Compliance

- Minimize life-cycle cost
  - Strategic uses of Capital and Operating resources
Critical Components of RCM

• Regulatory Safety Inspection Compliance
  *FRA regulations for Air Brake, Event Recorder, ATC, etc.*

• Periodic Inspection & Maintenance

• Planned Long Term Maintenance
  *Higher System-Level Maintenance performed when components reach end of useful life and require either overhaul or replacement. Performed at equipment maintenance facilities with enhanced resources.*
Asset Management Systems & RCM Process

- Work Plans
  - Material
  - Labor
  - Schedule
  - Shop & Equipment

- Planning Systems
- Inventory System
- Procurement System

Bill of Materials / Pick Lists / Bill of Labor / Production Requirements

- Data Reporting & Analysis
  - Tracking Work completed
  - Trend Analysis
  - Reporting

- Shop Work Order Management
  - Work Completed
    - Planned
    - Unplanned

- PI, PM and Campaigns
  - Work Due
    - Rolling Stock
    - RS Components
    - Shop Equipment

ASSET MANAGEMENT SYSTEM
1. Matl & Labor Requirements
2. Work Order Creation & Mgmt
3. Schedule RSU & Component Work
4. Inventory Management
5. Budgetary & Actual Costs
6. Track Planned & Unplanned Work
7. Trend Analysis
8. Reporting

LIRR → CAMS Maximo
MNR → AMS

M7 WMDS

Diagnostics
Common Goals & Opportunities

- **Ongoing Life-Exploration**
  Systems and Components are evaluated to establish rates of wear in order to determine when they require overhaul or replacement

- **RCM Review of Maintenance Effectiveness**
  Ongoing review of trends, component condition and reliability, failures, and shop efficiency

- **LIRR/MNR Joint RCM Task Force**
  Sharing of RCM, Engineering and Trend Analysis

- **Condition Monitoring Systems**
  Ride Quality Meter, Vibration Analyzer, Acoustic Bearing Tester

- **Design Modifications**
  When Components are identified to require a design change to improve component reliability or extend useful life
### LIRR - RCM Program Effectiveness

#### LIRR M-7 RCM Interval Optimization & Cost Avoidance

<table>
<thead>
<tr>
<th>System</th>
<th>Mac Interval</th>
<th>RCM Interval</th>
<th>Cost Reduction</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIR BRAKE VALVE C/O</td>
<td>3 year</td>
<td>6 year</td>
<td>$3,098,846</td>
<td>Age Exploration Waiver</td>
</tr>
<tr>
<td>3, 6 YEAR ASU</td>
<td>3, 6 year</td>
<td>3, 3, 9 yr.</td>
<td>$323,568</td>
<td>Desiccant c/o at 3 yr., Overhaul at 9 yr. due to teardown analysis and inspection.</td>
</tr>
<tr>
<td>Relay C/O</td>
<td>5 year</td>
<td>8, 12 year</td>
<td>$1,033,767</td>
<td>Split from 116 relays to 36 at 8 yr. 80 at 12 yr. due to tear down analysis &amp; inspection.</td>
</tr>
<tr>
<td>HVAC</td>
<td>5 year</td>
<td>10 year</td>
<td>$1,975,968</td>
<td>BOM Reduction and Interval Change due to tear down analysis &amp; inspection.</td>
</tr>
<tr>
<td>Aux Power</td>
<td>5 year</td>
<td>6, 12 year</td>
<td>$1,300,194</td>
<td>Replace bearing on A1556, moved Caps out</td>
</tr>
<tr>
<td>Electric Coupler</td>
<td>5 year</td>
<td>12 year</td>
<td>$1,369,536</td>
<td>Moved overhaul from 5 to 12 year due to age exploration.</td>
</tr>
<tr>
<td>Wheels</td>
<td>5 year</td>
<td>10 year</td>
<td>$2,573,397</td>
<td>All wheels 2 inches or larger stay on Trucks</td>
</tr>
<tr>
<td>Interior Car-Body</td>
<td>10 year</td>
<td>8, 16 year</td>
<td>$6,452,984</td>
<td>Delayed seat / cover replacement with age exploration</td>
</tr>
<tr>
<td>Halls Transformer</td>
<td>20 year</td>
<td>6 year</td>
<td>($61,250)</td>
<td>High fleet failure rate, required inclusion in earlier interval</td>
</tr>
<tr>
<td>Anti-Yaw Damper</td>
<td>5 year</td>
<td>RR</td>
<td>($1,041,600)</td>
<td>Excessive leakage required additional RR</td>
</tr>
<tr>
<td>Charging Contactor</td>
<td>12 year</td>
<td>6 year</td>
<td>($180,600)</td>
<td>Excessive tip wear, required addition to Propulsion System earlier interval</td>
</tr>
</tbody>
</table>

**Total Yearly Reduction: $16,844,810**

**Total Reduction over 5 year program: $84,224,050**

Note: Use PI scheduling and PI department to increase Shop capacity in order to optimize RCM intervals on systems and components.
MNR - RCM Program Effectiveness

• Reduced Fleet Labor requirement by 9.7% over the past ten years – Saving $17M Annually

• Material Reduction Initiatives in 2010 saved $24M

• Eliminated Off-Property Overhaul Projects saving Capital Funds
  – M3 PIP allows 138 Cars to operate reliably until replacement in 2020
  – 100 Center Door Coaches did not require overhaul due to 12Yr and 16Yr RCM
LIRR Challenges

- Implementation of PTC and ESA 250 Hz
- Diesel Locomotive Heavy Repair Facility
- Results of installing M7 GSA FMI design modifications.
**MNR Challenges**

**Harmon Shop Replacement:**
- Replace 100 year old Harmon Shop with a new EMU Shop to provide facilities required to implement M7/M9 higher level RCM

**New Haven Shop Facilities:**
- Work with CDOT to ensure New Shop Facilities are operational by 2014 to support higher level RCM maintenance for the new M8 Fleet

**Enterprise Asset Management System**
- Identify and acquire real time business tools to support cost-effective Reliability Centered Maintenance of rolling stock and establish new business processes based on PAS 55

**PTC Implementation**
- Design and Implementation of on-board systems by 12/31/2015
IEC M7 RCM Comments

• Railroads’ RCM Programs are logically structured and efficient.

• The time interval maintenance periods are evolving in a sound manner based on shared operational data.

• Railroads’ have the appropriate software tools to manage the program and progress improvements.